A STUDY ON THE UTILIZATION

OF PITCHES IN THE RUBBER INDUSTRY

FINAL REPORT BY:

S.R.I. TECHNICAL BARRIERS INC.
Mississauga, Ontario

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MICROMEDIA

EXECUTIVE SUMMARY

The study of the utilization of pitches in the rubber industry was prompted by the desire to develop an economically attractive outlet for the residua produced in the Hydrocracking process. The economic viability of a hydrocracker would be considerably enhanced if the price obtained for the residua is increased three or four fold.

The product to be made from the hydrocracker residua, referred to here as CANMET bottoms, was Mineral Rubber Asphalt used in the rubber industry. The study involved surveying the rubber industry to determine its needs for this product and to determine if there would be sufficient interest to commercially produce it using a combination of CANMET Bottoms and Banbury Oil which is a by-product of rubber processing and a problem to the industry environmentally.

The results of the study shows that Mineral Rubber usage has declined to such an extent as to make the project economically impractical. M.R.A. has been replaced in rubber formulations by several grades of carbon black even though carbon black is more expensive.

The information developed during the study suggests that CANMET Bottoms may be an ideal replacement for Coal Tar which is still widely used in the construction industry.

RESUME

L'étude de l'utilisation des brais dans l'industrie du caoutchouc est venue du désir de développer un débouché économiquement attrayant pour les résidus produits par le procédé de craquage des hydrocarbures. La rentabilité économique d'une installation de craquage des hydrocarbures pourrait être améliorée si le prix obtenu pour les résidus était multiplié par trois ou quatre.

Le produit, appelé résidus de distitllation CANMET dans ce document, qui peut être fabriqué en employant les résidus des installations de craquage, est un bitume de caoutchouc minéral utilisé dans l'industrie du caoutchouc. L'étude effectuée comprenait notamment une enquéte auprés de l'industrie du caoutchouc. Cette enquête avait pour but de déterminer les besoins de l'industrie pour ce produit, ainsi que l'intérêt qui pourrait exister à le produire commercialement en utilisant une combinaison de résidus de distillation CANMET et d'huile Banbury, qui est un sous-produit de la fabrication du caoutchouc et qui pose un probléme pour l'environnement.

Les résultats de l'étude montrent que l'utilisation du caoutchouc minéral a tellement décliné que le project n'est pas économiquement réalisable. Le bitume de caoutchouc minéral a été remplacé dans les formulations du catouchouc par différents grades de noir de carbone, bien qu'il soit plus cher.

Les informations rassemblées lors de l'étude laissent entendre que les résidus de distillation CANMET pourraient être un substitut idéal aux goudrons de charbon qui sont toujours utilisés intensément dans l'industrie de la construction.

APPENDIX "C"

DISCLOSURE CERTIFICATION

To be completed by the Contractor and returned to:

Mr. Steve Shipman
Science Procurement Officer
Science and Professional Services Directorate
Science Branch
Department of Supply and Services
Place du Portage, Phase III, 11C1
11 Laurier Street
Hull, Quebec
K1A 0S5

CONTRACT TITLE: A STUDY ON THE UTILIZATION OF PITCHES IN THE RUBBER INDUSTRY.

CONTRACT FILE NUMBER: 007SQ 23440-9-9021

CONTRACT NUMBER: 23440-9-9021/01-SQ

[XXX] – We certify that all applicable disclosures were submitted in compliance with General Conditions Research and Development and in accordance with the contract and the Science Branch Contracting Officer's instructions.

OR

[ ] We certify that there are no disclosures to submit under the above referenced contract, referred to in General Conditions Research and Development.

SIGNATURE: _____

PRINT NAME: R.K. Seaman

TITLE: President

COMPANY NAME: S.R.I. Technical Barriers Inc.

DATE: March 12, 1990

A STUDY OF THE UTILIZATION OF PITCHES IN THE RUBBER INDUSTRY

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INTRODUCTION

The market study on the utilization of pitches in the rubber industry was undertaken after consultation among Canmet and S.R.I. management staff to establish whether or not mineral rubber asphalt would be a desirable outlet for Canmet bottoms. The hardness and lack of ductility makes Canmet bottoms unable to be used neat for the more common applications such as paving asphalts for road construction and maintenance or for use in roofing applications.

The characterization of Canmet bottoms are similar to an asphalt product that was made by Gulf oil at its Montreal refinery in the 1950's and 1960's. The Gulf product was the residue of a decarbonizing unit and was used extensively as a mineral rubber asphalt. In the Montreal operation, the residue was emptied into a concrete holding bed and allowed to cool prior to loading into drums. Due to its hardness and brittleness, this asphalt shattered into chunks when scooped up with a front end loader. It was shipped as chunks in drums to almost all rubber companies in Canada and some of it went to export markets in the U.S.A.

The Canmet residue first examined was found to be too hard for it to be a direct replacement for the Montreal type asphalt. SRI proposed the addition of Banbury oil* to be used as a modifier to alter the softening point/penetration relationship through oxidation. Laboratory trial oxidation tests indicated that an equivalent product could be made through the use of 5-10% Banbury oil addition to the Canmet Bottoms and subsequent oxidation.**

* Banbury Oil is an oil seal used on Banbury machines at rubber companies.

**CANMET was unable to confirmed these test results but found an alternative method for the conversion of CANMET pitch to meet the Mineral Rubber Asphalt Specification.

Since the Montreal refinery went out of existence when Gulf Canada was taken over by Chevron and PetroCanada, there appeared to be a market niche which might be available for the Canmet residue processed as previously described.

In the interim since the Gulf Montreal refinery closure, all mineral rubber asphalt was imported from the U.S.A. The market study was set up to determine the size of the current market for mineral rubber asphalt and other relevant data on this market segment such as, pricing, import duties, packaging, product quality, product specifications. Also included in the data to be developed were market trends, customer preferences, customer differences, attitudes etc.

In the economics of the sale of hydrocrackers there is a problem with the sales realization on the 5 - 20% of the output considered as residua. Obviously, if the residua can be upgraded from its disposal use, the economics will improve proportionately. At present, the residua from the pilot unit at the Petro Canada site in Montreal is blended into fuel oil. While this use is a convenient disposal, it requires cutter stock to reduce its viscosity which results in a downgrading of the sales potential of the distillate/cutter stock.

The market study was aimed at significantly upgrading the sales realization of the residua eg. selling the residua as mineral rubber asphalt would result in a threefold increase in sales realization with disproportionately less cost to manufacture.

It is our understanding that Petro Canada has an oxidizer on site at its Montreal refinery which could be tied into the hydrocracker Therefore, the only additional equipment required would be a flaker and bagging equipment.

During the market study opportunities to investigate and include products similar to mineral rubber asphalt which use hydrocracker residua will also be highlighted. Additional product areas would enhance the saleability of the hydrocracking technology which is the overall objective of the study.

PHASE I

Introduction

This report covers the initial phase of our work and as such includes the usual start up problems and frustrations. In addition to gathering data on the Rubber Industry in Canada and the USA we prepared the initial questionnaire and developed a computer matrix to be able to track the information. Through this approach we are in a position to determine trends and shifts from initial interviews and focus on the main objective of singling out Mineral Rubber issues and opportunities.

Difficulties have been encountered in setting up interviews due to the holiday period at this time of year and strikes at the Uniroyal plants in Kitchener.

Preliminary indications are that most rubber companies in Canada are interested in new Canadian sources and will work to assist new suppliers.

Both the questionnaire and the data base will have to be modified as our work progresses to accommodate the trends the information is indicating.

Report Commentary

The attached questionnaire was developed to record the data obtained in the initial interviews. We have found that the detailed specifications segment is not appropriate at this stage. A second more detailed questionnaire is being developed for the follow up stages of the study. We would appreciate your comments and suggestions on improving the questionnaire.

Initial contacts were made with the Rubber Association of Canada and its President Mr. Brian James.

During the interview we were referred to Mr. Harry Johnson of Goodyear Tire Co. who was most helpful and informative. Our approach to the tire industry will follow the direction indicated by Goodyear.

The other principle Canadian interview was with Chris Mumford of Trent Rubber Services who was able to provide considerable information on the uses of Mineral Rubber by the Rubber Industry and suggestions as to the best approach to ensuring a successful entry into the market place. Price information was also available from Mr. Mumford.

In the U.S. contacts were initiated through Ted Meyer of Meyers Chemical, Buffalo to look into North Eastern U.S. Market.

In Stage II of the project we will push into the U.S. Akron Ohio market to establish both demand for Mineral Rubber Asphalt and the differences between the U.S. and Canadian market places. Our contacts will follow up on established contacts through the Resin supply side of the rubber industry. Resin which is used as a tackifier is widely used in the tire business. Data on the relative size of the rubber industry can be taken from the following information:

Phenolic Resins are used in the Canadian market by the companies listed below: The Resins are usually non heat reactive alkyl phenolic resins

General Tire	300,000 kg
Goodyear Valley Field	640,000
Trent Rubber	70,000
Firestone	50,000
Uniroyal Goodrich	250,000
Gates	60,000
United Tire	150,000
Dayco	150,000
Michelin Nova Scotia	250,000
TOTAL	1,920,000 kg

Preliminary Conclusions of Stage I

1. A market exists for Mineral Rubber Asphalt used as a filler and extender but it is not as large as envisioned and has declined as a result of a phase out in tire production resulting from the switch from bias to radial tires.

2. The price information we anticipated is valid and some options exist that allow for the potential development of Mineral Rubber Asphalt.

3. Major rubber companies in Canada are increasingly having major decisions made in the U.S.A. as companies combine to increase their size to compete globally eg. Firestone Bridgestone. The exception being Michelin which is already highly centralized into France.

4. The companies contacted to date welcome the presence of a new supplier and will cooperate with testing and approvals.

5. The potential to use Banbury Oil in our Mineral Rubber Asphalt is a welcome move which may help the industry begin to solve a major environmental problem with waste Banbury Oil.

6. It would be essential to separate the Banbury Oil from other waste oils which are currently dumped in to it.

7. The rubber companies would be willing to pay for Banbury Oil disposal.

8. Our market analysis appears to indicate that the Banbot product will have much greater potential in the area of mechanical goods.

Attachment 2 is a list of the current members of the Canadian Rubber Association.

Attachment 1

S.R.I. CANMET STUDY

DATA ON CONSUMPTION

1. Identify company, plant, location, affiliates, and/or subsidiaries

   eg. Uniroyal Goodrich — Uniroyal Goodrich

   Kitchener, Ontario — Waterloo, Ontario

   Key persons

   Telephone

   Fax

2. a) Use/do not use mineral rubber asphalt

   b) Use M.R.A. in tires - as filler - bias and/or radial tires

   c) Use M.R.A. in the following - Rubber Hose

   - Rubber Belting

   d) - Other (specify)

S.R.I. CANMET STUDY

3. Annual Consumption

Monthly variations

July shutdown? other? _____

Affiliates/subsidiary consumption

4. Industry trends specific comments on growth/non-growth

5. Specifications

a) Review the proposed specifications (attached) compare _____ (company) specs line by line vs. proposed specs.

b) Note any/all differences

c) Provide proof that proposed product meets/exceeds _____ specs.

S.R.I. CANMET STUDY

6. Discuss and note critical test parameters

a) What are they _____ how do they impact _____ products.

b) What variables, if any, do they want/need.

c) Specify for tires vs. mechanical goods.

d) Other.

7. Banbury Oil & Other Disposable problems

a) Does _____ have Banbury Oil to dispose?

b) How much do they have vol/yr?

c) How much is produced each month?

d) What is the current practice?

e) How cost effective is it?

f) Would they be prepared to pay to dispose of it?

g) Are they interested in our proposal?

h) How can we pick up the Banbury Oil Drum? Truck?

I) Do they have samples for us to work on?

S.R.I. CANMET STUDY

8. Pricing

a) Is the current supply imported?

b) Does it have duty & freight included or just freight

c) What is the price per c.w.t. delivered - confirmed

d) What is the price per c.w.t. delivered - estimated

9. a) S.P.C., is _____ using statistical process control.

b) What must we do to comply?

10. Packaging

a) How is product received now? Drums, bulk, chunks, other (specify).

b) How would customer prefer it?

c) Dust free

d) Pellets

e) Will he pay a premium for pellets?

f) in 25 kg bags

g) Paper

h) Plastic

S.R.I. CANMET STUDY

11. Terms net 30?

    Other

12. Credit reference if applicable yes/no

13. Other products

    a) Is the customer interested in process oils

    b) Volume

    c) Price

    d) Delivery

14. Disposal problems?

Attachment 2

Aeroquip (Canada) Inc.	287 Bridgeland Ave. Toronto, Ontario M6A 1Z7 (416) 781-5261 FAX: 781-5878	George Harrison President
American Biltrite (Canada) Ltd.	200 Bank Street Sherbrooke, Quebec J1H 4K3 (819) 566-6660 FAX: 819 821-2624	Richard Miquelon Vice-President & General Manager
Armet Industries Corporation	65 Spruce Street P.O. Box 100 Tillsonburg, Ontario N2G 4H3 (519) 842-6451 FAX: 519 842-8770	Eric S. Kilner Vice-President & General Manager
Associated Industrial Rubber Co. Ltd.	9555 Ouest Henri-Bourassa Montreal, Quebec H4S 1S7 (514) 336-2480 FAX: 514 336-5744	Bob Calder President
Bandag Canada Ltd.	1240 Commissioners Rd.W. Suite 201 London, Ontario N6K 1C7 (519) 473-2450 FAX: 519 473-5053	G. (Bud) Wilkins Vice President
Baron Rubber Ltd.	851 Baron Street St. Jerome, Quebec J7Y 4E1 (514) 436-2433 FAX: 514 436-8495	Robert Andres General Manager & Corporate Secretary
Biltrite Rubber (1984) Inc.	170 North Queen St. Etobicoke, Ontario M9C 1A8 (416) 626-0700 FAX: 626-5156	Tom Lennox Ontario SAles Manager

Cardinal Rubber Manufacturing Inc.	842 Farewell Ave. Oshawa, Ontario L1H 6N7 (416) 365-0420 FAX: SAME	Harry Snowden President
Dayco Products	46 Norelco Drive Weston, Ontario M9L 1S3 (416) 741-3900 FAX: 741-3816	Frank Reeves Vice President & General Manager ✓
Dunlop Construction Products Inc.	2055 Flavelle Blvd. Mississauga, Ontario L5K 1Z8 (416) 823-8200 FAX: 823-5100	David W. Brazier President and General Manager
Dunlop Industrial Limited	3 Pullman Court Scarborough (Tor.) Ont. M1X 1E5 (416) 297-0569 FAX: 297-9324	Bob F. Hilton President
Dura Undercushions Ltd.	8525 Delmeade Road Montreal, Quebec H4T 1M1 (514) 737-6561 FAX: 514 342-7940	David W. Beal President
Epton Industries Inc.	521 King Street West Kitchener, Ontario N2G 1C5 (519) 744-6530 FAX: 519 744-7566	Michael Weedon President ✓
Escalator Handrail Company	1287 Boundary Road Oshawa, Ontario L1J 6Z7 (416) 432-3200 FAX: 432=2906	Ron Ball President
Firestone Canada Inc.	120 King Street West Suite 750, 7th Floor P.O. Box 2025 Hamilton, Ontario L8N 4C6 (416) 521-1111 FAX: 416 521-5782	W. Mitchell President

Gates Canada Inc.	50 Iroquois Street Brantford, Ontario N3T 5R6 (519) 759-4141 FAX: 519 759-4567	Peter Tekker Vice President Manufacturing
General Tire Canada Inc.	220 John Street Barrie, Ontario L4N 2L3 (705) 726-6520 FAX: 705 726-6520 Ext. 223 or 339	Jim Malcolm Vice-President Sales & Marketing
GenCorp Canada Inc.	John & Bernard Streets P.O. Box 1002 Welland, Ontario L3B 5R9 (416) 735-5631 FAX: 735-5564	Wayne Smith General Manager
Goodall Rubber Company of Canada Ltd.	Pretty River Parkway P.O. Box 188 Collingwood, Ontario L9Y 3Z5 (705) 445-1551 FAX: 705 445-8030	Don M. McFarlane Plant Manager
Goshen Rubber of Canada Ltd.	100 Stafford Drive Brampton, Ontario L6W 1L4 (416) 457-5843 FAX: 457-4373	Edward S. Johnson Vice President Canadian Operations
Goodyear Canada Inc.	10 Four Seasons Place Islington, Ontario M9B 6G2 (416) 626-4611 Ext.8319 FAX: 620-8400 GEN: 620-8300	Scott H. Buzby President
Hamilton Kent of Canada Ltd.	77 Carlingview Drive Rexdale, Ontario M9W 5E6 (416) 675-7822 FAX: 674-6960	Surinder Minhas Technical Director

Industrial Tires Limited	3161 Wharton Way North Mississauga, Ontario L4X 2B7 (416) 625-1600 FAX: 625-1277	Bob Pilmer President
Lancaster Colony Canada Inc.	2531 Stanfield Road Mississauga, Ontario L4Y 1R6 (416) 896-8828 FAX: 896-9147	Thomas Hunsche, Pres. John Kloosterziel Marketing G.M.
Michelin Tires (Canada) Ltd.	175, Bouchard Dorval, Quebec H9S 5T1 (514) 636-5920 FAX: 514 636-6828	Jean Pochet Vice-President & Gen. Manager
Scandura Canada	P.O. Box 2230 Bracebridge, Ontario P0B 1C0 (705) 645-5276 FAX: 705 645-3112	Bob (R.C.) Haley General Manager
Standard Products (Canada) Limited	1030 Erie Street Stratford, Ontario N5A 6V7 (519) 271-3360 FAX: 519 271-6692	Bruce C. Machin Vice President Rubber Operations
Stedfast Inc.	230 St-Charles South Granby, Quebec J2G 3Y3 (514) 378-8441 FAX: 514 378-1558	George Economides Executive Vice-Pres. Gerald Hogan (514) 482-8092
Thona Inc.	1635 Industrial Blvd. Magog, Quebec J1X 5B3 (819) 843-0494 FAX: 819 843-7956	Rolf Nutten President
Trent Rubber Services Inc.	100 Albert Street S. Lindsay, Ontario K9V 3H7 (705) 324-6891 FAX: 705 324-1660	Dave W. Hay Chairman & C.E.O.

Uniroyal Goodrich Canada Inc.	409 Weber Street West Kitchener, Ontario N2G 4S5 (519) 749-3797 FAX: 519 749-3628	Bill Davis President
United Tire & Rubber Co. Limited	275 Belfield Road Rexdale, Ontario M3W 5C6 (416) 675-3077 FAX: 675-4337	Husky Sherkin President
Wynn's - Precision Canada Ltd.	P.O. Box 190 Precision Drive Orillia, Ontario L3V 6J3 (705) 325-2391 FAX: 325-5721	Robert Moloney President

Phase II

Introduction

The second phase of our work involved many more visits and data on the tire and rubber industry in Canada and the U.S. The information gathered has indicated that there has been a considerable reduction in the use of mineral rubber asphalt in all types of rubber goods and it has gone out of use in new tires.

In Phase II we have been concerned with detailed follow-up discussions with those companies who use mineral rubber asphalt to determine how and why they use it. Initial indications of wide spread use in the U.S. industry have not proven out to-date.

It will be necessary to confirm the usage and technical advantage of our proposed product may have vis-a-vis competitive products now in the market place. The commercial success of the project will depend on the size of the market for this mature product and whether the characteristics of it will provide a basis for displacing the products currently available.

At this point there is no doubt that the potential use of Banbury Oil has elicited considerable interest from major tire companies who are very concerned about environmentally acceptable disposal of this by-product of their manufacturing plants.

Report Commentary

In the second phase of our study, we have developed general data on the rubber and tire industry and contacted many more companies in Canada and the U.S.A. Our visits to Buffalo and Akron have initiated activities which will result in data on Mineral Rubber usage in both tire and mechanical goods.

In the tire industry, there is a steady trend to fewer, larger tire producers with more centralized direction for purchasing, manufacturing and marketing.

The following table indicates the change and consolidation for the years 1985 through 1987.

The U.S. Tyre Industry and its Market

Introduction

The US tyre industry and its market are the largest in the world: domestic tyre deliveries account for approximately 45 per cent of the OECD total, and US companies account for five of the top ten places in the European Rubber Journal's annual survey of the world tyre industry (see table below). A US company - Goodyear - claims first place in the world league. This is contested by Michelin of France, but comparisons are complicated by exchange rate and accounting conventions.

Table 1

The top ten tyre manufactures, 1985-87

($mn)

Rank	Company	Country	1987 Tyre sales	1987 % of total	1986 Tyre sales	1986 % of total	1985 Tyre sales	1985 % of total
1	Goodyear	USA	7,305	74	6,630	73	6,190	74
	Kelly-Springfield	USA	1,242	17	1,150	17	1,050	17
2	Michelin	France	7,262	93	6,217	93	4,825	93
3	Bridgestone	Japan	3,972	70	3,086	71	2,632	73
4	Sumitomo	Japan	2,736	80	2,407	85	1,510	87
5	Firestone	USA	2,630	68	2,416	69	2,485	69
6	Pirelli	Italy	2,420	44	2,068	44	1,694	46
7	Continental	West Germany	1,774	70	1,623	71	1,292	70
8	Uniroyal-Goodrich	USA	1,678	82	1,926	90	----	--
	B F Goodrich	USA	---	--	660	26	1,184	37
	Uniroyal	USA	---	--	550	--	953	45
9	Yohohama	Japan	1,436	70	1,189	71	933	78
10	General Tire	USA	1,175	--	1,118	36	1,156	38

a Part of Goodyear, b Part of Uniroyal-Goodrich since 1986.

Source: European Rubber Journal

Since the table was compiled, Firestone has been acquired by Bridgestone (see below), as a result of which Bridgestone has moved up to third place, with combined tyre sales of $6.6 bn in 1987. General Tire (number ten) has been acquired by West Germany's Continental, as a result of which Continental has moved up from seventh to fourth place in the global league, with combined sales of $2.9 bn, and the USA Cooper (see table below) has moved into tenth place, with sales of $540 mn.

The trend away from bias to radial tires continues except in the production of truck tires as shown to the table below on the tire productions.

	Cars		Commercial Vehicles	
Year	Radial	Total	Radial	Total
1982	102,322	149,481	7,634	29,019
1983	109,796	156,256	9,740	30,667
1984	131,512	172,934	13,753	36,441
1985	130,952	162,584	15,815	34,339
1986	135,444	159,350	15,476	30,939
1987	147,825	167,522	20,176	35,455
1988				
Jan	12,994	14,386	1,770	2,959
Feb	13,427	14,893	1,879	3,134
Mar	14,311	15,872	2,060	3,433
Apr	13,198	14,618	1,875	3,024
May	13,086	14,438	1,827	2,965
Jun	13,581	14,883	1,865	3,058
Jul	11,613	12,492	1,599	2,530

Tire Replacement Market

Three car tires in four and four truck tires in five are sold for replacement. The U.S. market for replacement tires is over 155 million units with a growth of 2%/yr.

Giant Tires

The market outlook for giant tires used on off the road equipment is bright with growth in demand in excess of 10%/yr. Radial tires are not a major factor in this application.

Retreads

Some 37 million retread tires were sold in the U.S. in 1987. They account for about 38% of commercial vehicle tires.

Based on our findings to-date, mineral rubber asphalt is no longer used in tire manufacture except for retread tires. We have been advised that 3 million pounds of mineral rubber asphalt is consumed by this market, but we have not been able to verify such volumes and do not believe the volume is that large.

We have excellent data on companies that manufacture rubber goods and have concentrated on 1) the tire retread industry and 2) mechanical goods manufacturing, as the areas where it is most likely that demand for mineral rubber asphalt will be found.

Enquires have been made to the following companies:

Company	Address	Contact
Bata Footwear	Batawa, Ontario	F.C. Mels - Vice President
Cardinal Rubber	Oshawa, Ontario	J. Navaratne - Chemist
Clevite Industries	St. Thomas, Ontario	
American Biltrite	Sherbrooke, Quebec	J.C. Mercier - Mgr.
Ancaster Paving	Ancaster, Ontario	L.B. Harvey
Argus Industrial Supply	Winnipeg, Manitoba	Easton - President
Bandag Canada	Shawingan, P.Q.	W.D. Herd - President
Baron Rubber	St. Jerome, P.Q.	Whisseu - Purch. Mgr.
Epton Industries	Kitchener, Ontario	Edith Giertz - Chemist
Industrial Rubber Supply	Winnipeg, Manitoba	G. Henderson
Jacobs & Thompson	Weston, Ontario	M. Ramsay - Chemist
Lindsay Rubber Prod.	St.Catharines, Ontario	R. Lindsay - President
Ontario Rubber	Rexdale, Ontario	H. Pauls
Skega	North Bay, Ontario	H. Van Luttikhuisen
Viceroy Products	Toronto, Ontario	R. Bruhm

Competitive Products - Mineral Rubber Asphalts being consumed by the rubber industry.

Rubber companies have identified MR-38 and Pionneer 42 as the type of products they are using at landed costs in excess of $0.30/lb. Todate, most companies contacted, with the exception of the major tire companies, use two or three metric tonnes per year. All are open to offers of new supply.

People in Akron suggested we use a testing company in Akron to test our candidate product against Mr-38 and Pionneer 42. Their tests would be aimed at determining what advantages, if any, our candidate product would have over the others. Once this information is available it could be used to develop sales within the rubber industry.

We will attempt to obtain samples of all competitive products in preparation for similar comparative testing.

Contacts

In phase II of the study, SRI personnel have contacted, visited and reviewed the mineral rubber project with the following people in addition to the mailings noted earlier in the report.

Name	Company	Area of Activity
Sol Samson	Biltrite Industries	Custom blended rubber
Bob Scherer Karen Baxter	Gates Rubber	Mechanical Goods - Auto
Purchasing Agent	Scandura Rubber	Master Batch made by Burton Biltrite & Tecnal
Peter Boccfuso	Diversitac General	Mechanical Goods
Richard Martin	Standard Products	Retread Tires (Oliver)
Ron Anderson	Western Reserve Chemical Akron Ohio	Supplier to Rubber Co.
Lindsay Terriault	Goodyear Tire, Bowmanville	Conveyor Belts

Conclusions

At the end of Phase II of the project, it is apparent that a significant change in in the demand for Mineral Rubber Asphalt has resulted from the change to radial tires from bias tires. Along with this change, many ingredients in the radial tire recipes have been upgraded to the detriment of mineral rubber asphalt. It is likely that Mineral Rubber Asphalt has been replaced by various types of carbon black which is considered a much more sophisticated product.

Mineral Rubber asphalt had been used in tire production because it was a cheap, available filler. The product was a by-product of major oil refineries and as such had very little quality control or refinements. With the demise of the oil refineries, Mineral Rubber Asphalt is no longer cheap nor available. It all must be imported into Canada and it has largely been replaced by carbon black. The technology of carbon black has advanced over the years and specific blacks are used in specific parts of the tire, eg. a different black is used in the tread than the type used in the side walls or carcass.

It is now necessary to investigate the use of Mineral Rubber Asphalt in retread tires, off the road tires and a wide range of mechanical goods. It has been suggested that a highly aromatic mineral rubber asphalt will have good solvency and act as an extender in many mechanical goods applications.

The hardness of the mineral rubber asphalt makes it an attractive additive to rubber formulations used to make bumpers for docks, trailers etc. as well as mallets and similar impact implements.

The price of $0.18 - $0.20 per pound has been verified and is very competitive especially when competing with imports where duty and transportation significantly increase the price to well beyond $0.30/lb.

Our efforts will now be directed to determining the volume and price of mineral rubber asphalt outside of the tire markets. It will be necessary to indicate the solvency advantages of our candidate product to gain customer acceptance to test for approval.

PHASE III

INTRODUCTION

MARKET SIZE UP

DATA FROM U.S. VISITS & CONTACTS

GRID DATA

CONCLUSIONS - MARKET

- PRODUCTION

FUTURE WORK - ANOTHER MARKET?

- OXIDATION AS A MEANS OF UPGRADING

PROPOSED MEETING

CANMET

Introduction

The third phase of the market study is focused on detailed follow up visits and meetings to establish whether the change in usage of Mineral Rubber Asphalt was as dramatic as indicated in the first phase. In this phase, we talked to various levels of management and product specialists to improve our understanding of how the product is used. These discussions brought out more information on the demise of the product.

Contact with smaller, more specialized companies, provided some indication of where a product like Mineral Rubber Asphalt might be used. These specialized markets do not relate to the rubber industry and will require further study to define their size and economic viability.

Market Size Up

Our objective was to contact 20% of the companies who would represent 80% of the consumption of Mineral Rubber Asphalt. Due to strikes, vacations and work loads, we ended up contacting many more companies to make sure that we did not overlook a company that might still use the product in large quantities because of its own particular formulae.

The attached computer summary indicates a total annual consumption of 700,000 #'s, add 30% not identified the total is about 1 million Lbs., which is considerably less than the three million pounds originally envisaged.

Early on in the study, we discovered the Mineral Rubber Asphalt had largely been displaced in the tire industry with the conversion from BIAS to Radial tires. Radial tires are more durable, safer and have better rideability and, are therefore, able to command better prices in the market place. Better quality means that radial tires are built with improved ingredients and the cheaper, non-specific products like Mineral Rubber are no longer used.

The following is a summary of a cross-section of the market which more than represents the 20% of the market for rubber consumption. Many of the U.S. and Canadian companies listed below handle similar products and serve similar markets. Several use Mineral Rubber Asphalt and many others do not, depending on the sophistication of their blends/products. This sampling provides a view of this diverse industry.

Bridgestone Lavergne Tennessee

Employees - 1250
Markets - Automotive, Auto Aftermarket Military and Mining
Base Rubbers - Butyl, Natural Rubber, Nitrile, Polybutadiene, Polyisoprene S.B.R.
Products - Tires passenger bus and truck
M.R.A.situation - Annual consumption 200,000 lbs.

Firestone Headquarters Akron, Ohio

Employees - 55,000
Net Annual Sales - $3/5 Billion
M.R.A. situation - Approximately 200,000 lbs/yr.

Firestone Desmoines, Iowa

Products - Farm tractor and vehicle tires
M.R.A. situation - Approximately 200,00 lbs/yr.

Midwest Rubber Reclaiming Co. Custom Mixing Division

Services - Custom mixing
M.R.A. situation - 55,000 lbs/yr.

BF Goodrich, Uniontown, Ohio

Employs - 10,000
Markets - Appliance, Automotive, Construction, Food processing, Oil and Gas, Paper and Printing.
Base Rubbers - Acrylic, Butyl, EPDM, Nitrile, SBR, Urethanes
Products - Belting, Auto hoses, Wrapping, Fuel handling equipment.
M.R.A. situation - 100,000 lbs/yr.

Goodyear Tire & Rubber, Akron, Ohio

Employs - 115,000
Sales - $9.1 Billion
Markets - Appliance, Automotive, Construction, Military and Mining.
Base Rubbers - Butyl, Nitrile, SBR, Natural, Urethanes
Products - All automotive parts and assessories, Bladders, Shoe products, Fuel handling equipment.
M.R.A. situation - No usage.

McCready Rubber Co., Piney Flats, Tennessee

Employs - 28
Markets - Automotive, Machinery, Mining
Base Rubbers - Butyl, Coated Fabrics, Wear Parts
M.R.A. situation - No usage

Ohio Rubber, Willoughby, Ohio

Employs - 1,000
Markets - Auto - Auto Aftermarket, Military, Mining, Oil and Gas.
Base Rubber - Natural, EPDM, Acrylic, Butyl, Urethanes
Products - Bumpers, Elastomer goods, Industrial products
M.R.A. situation - No usage

Paeco Rubber Co., Ravenna, Ohio

Employes - 83
Markets - Auto, Auto Aftermarket
Base Rubber - Acrylic, Butyl, EPDM, Nitrile reclaimed.
Products - Mechanical goods, Tire, Repair items, Shock mounts.
M.R.A. situation - No usage

Akron Rubber, Canton, Ohio

Employs - 200
Markets - Auto and Auto Aftermarket
Base Rubber - Butyl, EPDM/EPM, SBR
Products - Mats, Molded goods, Mounts etc.
M.R.A. situation - No usage

Chardon Rubber, Chardon, Ohio

Employs - 1000
Gross Sales - $60 million
Markets - Appliance, Construction and Footwear
Base Rubbers - Butyl, Nitrile, Polychlorine, SBR
M.R.A. situation - No usage

American Biltrite, Sherbrooke, Quebec

Employs - 325
Markets - Appliance, Automotive and Footwear
Base Rubbers - Butyl, EPDM, Natural, SBR reclaimed
Products - Belts, Flooring, Shoe products, Splash guards
M.R.A. situation -

Baron Rubber, St. Jerome, Quebec

Employes	- 250
Annual Gross Sales	$13.5 million
Markets	- Auto, Footwear, Military, Wire and Cable
Base Rubbers	- EPDM, Nitrile, Natural, Urethanes
Products	- Bladders, Bushings, Industrial products and Shoe products
M.R.A. situation	- 4400 #'s/yr

Biltrite, Etobicoke, Ontario

Employs	- 75
Markets	- Auto, mining and oil
Base Rubber	- SBR, EPDM, Polybutadiene
Products	- Belts, boots, bumpers, conveyor belts
M.R.A. station	- 8800 #'s/yr

Cardinal, Oshawa, Ontario

Employes	- 78
Gross Sales	- $5 million
Market	- Auto, Military, Oil and Gas
Base Rubber	- Butyl, EPDM, Natural, Nitrile
Products	- Appliance, Automotive, Aircraft parts
M.R.A. situation	- No usage

Epton Industries, Kitchener, Ontario

Employs	- 450
Markets	- Appliance, Automotive, Construction, Oil and Gas
Base Rubbers	- Butyl, EPDM, Nitrile, SBR blends
Products	- Appliance, Gaskets, Auto specialties, Hoses
M.R.A. situation	- No usage

Jacobs and Thompson

Employs	- 100
Markets	- Appliance, Automotive, Construction, Footwear
Base Rubbers	- EPDM, Nitrile, Urethanes
Products	- Adhesive, Appliance parts, Extruded products
M.R.A. situation	- No usage

Kaufman, Kitchener, Ontario

Employs	- 1150
Markets	- Construction, Footwear, Consumer direct
Base Rubbers	- Natural, Nitrile, SBR, Urethane
Products	- Clothing, Foamtreads, Splash guards
M.R.A. situation	- 12000 #'s/yr

Standard Products, Stratford, Ontario

Employs - 1300
Markets - Automotive
Base Rubbers - Natural, EPDM, Reclaimed
Products - Automotive, Mounts, Seals, etc.
M.R.A. situation - No usage

Trent Rubber Services, Lindsay, Ontario

Services - Extruding, Milling, Molding, Processing and Reprocessing
M.R.S. situation - 30,000 #'s/yr

Goodyear Canada, Headquarters Canada & Subs @ Bowmanville & Quebec City

Employs - 5870
Annual Net Sales - $632 million
Markets - Appliance and Auto, Oil and Gas
Base Rubber - Blends, Butyl, EPDM< Natural, Nitrile
Products - Total rubber product line
M.R.A. situation - Bowmanville - 80,000 #'s/yr
- 65,000 #'s/yr

Product Acceptance

Due to declining use of M.R.A. by the tire companies, it is extremely difficult to get them to take the time to discuss it at all. If they are approached about a product which is a key ingredient in their manufacture, it is not a problem to set up appointments. Generally, both the purchasing and technical people will attend such meetings to allow for a complete discussion of how the product is used and why it works the way it does. Items such as package, price delivery, consumption advantages and disadvantages all be obtained relatively easily.

As a result of many meetings and review of the data garnered, sometimes reluctantly, M.R.A. appears to be used either when all else fails, or because

it is cheap and has been kept in old recipes. For instance, Firestone will use it to solve production problems which may be as a processing aid or extender. Goodyear says its use is as a material to absorb excess oils. Whether or not these two approaches are similar or identical, we do not know. What we do know, is that the product is accepted for such use, but then it is worked out of the formulation as soon as the problems have been overcome.

The use of M.R.A. in Bus, Truck and Tractor tires, as well as some mechanical goods and in shoe formulations, suggests that it adds durability and hardness to these products. However, due to the reluctance of these companies to discuss its applicability, we can only speculate.

The compounders also noted that carbon black is offered in may types and sizes which allows them to select a specific type to achieve a specific function. eg. high tensile carbon black or a carbon black which will provide greater bending capability.

Mineral Rubber Asphalt originated as a refinery by-product and was never developed to exploit the needs of the rubber industry. As a by-product, little or no development work was put into it and the price alone dictated its use. With BIAS tires, the companies were able to use locally available, cheap materials in their formulations and the tires were considerably cheaper than they are today, but were also less durable.

Even though it is possible to vary the quality of Mineral Rubber Asphalt and to make several types or grades to provide high tensile, more ductile material, it is unlikely to be economically feasible. To gain approval for new types of mineral rubber asphalt would take 4 - 5 years and the possibility of displacing carbon black is very remote. The rubber companies can approve locally available product for their needs, but are usually controlled by a head office group that evaluates new products and will only do so if there is a significant economic advantage.

Most consumption of Mineral Rubber Asphalt is confined to custom batch formulations, which are compounded by companies who compound for an individual customer according to his formulation. Where it is specified in the formulas, it is used.

Data from U.S. visits/contacts

Firestone / Bridgestone - U.S.

Met with:

Mr. John Macdonald, Purchasing Manager

Mr. Ron Kohon, Technical Manager

Mr. Hiroyuki Ito, Executive Vice-President, Bridgestone, Japan

Mr. R.A. Fankhauser, Senior Mgr. Purchasing, Bridgestone, U.S.A.

Firestone U.S. stopped using M.R.A. at the beginning of 1989, except for their farm tire operations, which are centered in Des Moines, Iowa, where consumption is <200,000 #'s/yr.

They often use it to solve problems, as a processing aid at their tire plants and then formulate to get it out of their products. They do not foresee it ever making a comeback, as they have switched to higher quality and more specialized products.

Bridgestone U.S.

Uses Mineral Rubber asphalt at the rate of 200,000 #'s/yr at their Nashville bus and truck tire plant

B.F. Goodrich U.S.

Usage is approximately 200,000 #'s/yr. Their purchasing people in the U.S. and Canada, are extremely reluctant to talk to us regarding a new supplier since this is a declining market and does not warrant their time for evaluation.

Goodyear Tire & Rubber U.S.

No usage.

McCreary Tire & Rubber U.S.

No usage.

Ohio Rubber, U.S.

Akro Rubber, U.S.

No usage.

Chardon Rubber, U.S.

No usage.

Midwest Rubber, Akron, Ohio

Sue Hedrock, Purchasing Manager

Mineral Rubber is still being used at a rate of 50 - 60,000 #'s/yr. They master batch and blend for their customers. Mineral Rubber is used where it is specified, but its use is declining. It is used both as an extender and as a processing aid.

Price ranges from $0.018 - $0.20 /lb U.S. They buy 10,000 #'s per shipment, crushed in 50# bags.

No problem in switching to a new source if there is a price incentive.

Midwest use 7 - 8 truckloads/mth. of Rubber Process oils. They dispose of their Banbury oil by paying a recycling company to take it away. This company assumes the EPA responsibility. Like all rubber companies, they would be interested in our ideas about the use of Banbury oil incorporated into the asphalt product.

Conclusion #1 Mineral Rubber Asphalt is being phased out

The switch from bias to radial tires has eliminated the use of M.R.A. in passenger tires. The higher quality tires use carbon black in place of Mineral Rubber Asphalt. In all our meetings, we did not find one instance of increasing use of M.R.A. but we were advised that it is being phased out entirely.

Rubber compounders and blenders still use M.R.A. in blends specified by their accounts, especially in mechanical goods. However, this use is also declining.

Conclusion #2 Consumption has steadily declined and the trend will not be reversed.

Most companies have consolidated their operations and shifted specialty tires and mechanical goods to one or two locations. The drop in consumption has been very dramatic in the past five years and many ceased its use last year.

Since this trend will not be reversed it would require alternate high growth outlets to establish a market basis. The rubber industry which has been a large consumer of many raw materials, will remain committed to carbon black at the expense of M.R.A. Carbon black is available in many grades and forms, which allows the compounder to develop the characteristics he requires by using specific grades fro specific properties. M.R.A. by contrast is a dates petroleum by-products which offers little flexibility in rubber applications.

Conclusion #3 Rubber companies will not devote time to developing and improving a product without a considerable incentive and M.R.A. does not offer a potential incentive.

As the tire industry continues to consolidate into fewer and larger companies, there is increased centralization and control of research and development funds. Approvals for new products will be difficult to obtain regardless of the product, but particularly if there is no great incentive, ie. price reduction, or performance improvements. Approvals are long and costly which means local plants are less and less autonomous.

Conclusion #4 Mineral Rubber Asphalt sales pricing is in the predicted range ie, $0.18 - $0.22 /lb. U.S.

All price information confirms that major U.S. companies buy in the $0.18 - $0.22 /lb price U.S. range, while Canadian prices are at $0.35 - $0.40 /lb Canadian, reflecting currency, duty freight and volume discounts. Such pricing is consistent with a comparison of paving and roofing asphalts versus M.R.A. M.R.A. would command a premium of $100 - 150 /tonne, but an allowance for crushing must be factored against M.R.A. To penetrate a mature market would require offering a price advantage which further diminishes the potential profit.

Conclusion #5

It would not be economically feasible to develop a business based on M.R.A. at this time.

The decline in the use of M.R.A. suggests that it may be entirely discontinued in the foreseeable future. Without a stable or growing demand for the product or a technical advantage that such a product might have over carbon black there would be no point in investing in the manufacture and marketing of M.R.A.

In the event that another end use refining a product very similar to M.R.A., it may be possible to supply some of the market economically ie, as an add on to the volume of the main line product. No prudent investor would proceed with a M.R.A. project in the rubber and related industries today.

Conclusions

Production

We think it is possible to produce M.R.A. from Canmet bottoms and their is considerable interest in combining Banbury oils with Canmet bottoms as a mean of safely disposing of Banbury oil. The equipment and storage at Petrocan's refinery in Montreal would be well suited to making much product but another market is required with must more growth potential.

Future Work

During the conduct of this study, we have become aware of a market for extremely hard asphalt or pitch, like the proposed M.R.A.

For some time, targets for skeet shooting have been made in Hensall, Ontario, by a company called Gold Dust Targets, operated by Mr. Brad Mann. He recently ceased operations and now buys and distributes Remington targets imported from the U.S.A.

Remington operate out of New York and supply most of the targets in the U.S.A. and now Canada. We will try to obtain more details on consumption and specifications.

Our understanding is that a material similar to M.R.A. is filled with 40% by weight of limestone dust and then pressed into moulded targets.

Materials like extremely hard asphalt or coal tar pitch are the normal binder for such targets. The coal tar pitch is a problem to handle due to toxic fumes and asphalts are therefore preferred. The hardest and brittlest binder is what is sought by the target manufacturer.

Oxidation as a means of upgrading Canmet bottoms

In the Banbot technology proposal, it was mentioned that oxidation of Canmet bottoms offered a way of improving the market ability of this portion of the Hydrocracker yield. Although the market for Mineral Rubber asphalt has changed too much to make its production profitable, the same equipment can be used to make electrode pitch and/or similar products.

Proposed Meeting

To review the work done by S.R.I. and coordinate it with the laboratory work done by Dr. Sawatzky, we propose a meeting at Canmet labs. Such a meeting, would permit the sharing of insights and information and determine what further work should be done.

CONCLUSIONS

A. The end result of the market study on mineral rubber asphalt is the conclusion that the market for such a product is in decline and insufficient to justify commercialization of the Banbot technology.

B. Potential customers for mineral rubber asphalt are not interested in spending any money to qualify product from a new supplier for a product which is systematically being replaced in their formulations by various types of carbon black.

C. The rubber tire industry has been going through a large reorganization and shakeout. Many smaller companies have been bought out by larger companies eg. Goodyear, Bridgestone, etc. In a very short while, there will be only three or four large global tire companies.

D. Rubber technology has advanced considerably through the use of new techniques and more sophisticated products. In the past, many rubber manufacturers operated independently and used locally available products. These methods produced a wide variety of tire and mechanical goods recipes. Large tires were cheap and did not last as long as present day radial tires. The concentration of tire production into the hands of a small group of global products has and will result in higher tire purchase prices, albeit, for better longer lasting tires.

E. Other changes noted in the rubber industry relate to the advent of custom blenders and recyclers. Custom blenders now toll process for larger companies and must follow formulations set up by the larger companies.

RECOMMENDATIONS

All of the information gathered in this study should be maintained in a manner which will make it readily available if developments in other related areas result in commercialization. Mineral rubber asphalt is still being used and if it was produced as a co-product, or bi-product along with another viable product, the economic would be favourable.

The market for a very hard material used in trap shooting targets is several million pounds and there is an interest on the part of Remington Arms in another supplier. S.R.I. is gathering the information from Remington and will work with Canmet personnel to provide a sample of its product to Remington. Once the sample is approved and specifications assured, S.R.I. can develop a commercial contract if Canmet decides it wishes to proceed.

During the course of our study, several other products and markets became apparent. Although the volumes of such products are not as great as either mineral rubber asphalt and the trap pitch they represent additional outlets for Canmet Bottoms and should be pursued as part of the commercialization of the project.

In meetings with Canmet laboratory staff, a greater understanding of the nature of the Canmet bottoms developed. It appears that the residua from the Canmet process is something between a coal tar and an asphalt. This presents at least two scenarios which should be developed, (1) the potential to develop a superior roofing material and (2) the potential for use of the residua and sidestreams by the coal tar industry.

ROOFING

It has been well documented that coal tar roofs outlast all other forms of roofing materials and especially asphalt roofs. e.g. coal tar roofs last 50 years whereas asphalt roofs average between 15 - 10 years. It is the natural anti-oxidants present in coal tar which resists aging by oxidation and sunlight. Since Canmmet bottoms appear to be in between coal tar and asphalt, there is the potential for Canmet bottoms to be used as a blending agent to produce superior asphalt roofing products. To prove out this theory requires a series of weatherometer tests to develop comparative performance results between coal tar, asphalt and a blend of asphalt and Canmet bottoms. It is recommended that steps be taken to have PetroCanada use such tests on equipment it has in the Sheridan Park research facilities. S.R.I. can provide liaison if required.

COAL TAR INDUSTRY

Initial contacts with a Carbochem Ltd. indicates that they would have an interest in examining both the residua and the sidestreams from Canmets' hydrocracker process. From detailed discussions S.R.I. had with the coal tar company's chief engineer, it is apparent that they have used bottoms and sidestreams from various types of crackers. In addition to providing Canmet with detailed brochures on the coal tar company's products, S.R.I. will obtain a detailed specification for their residua requirements.

A working agreement between Canmet and the coal tar company should be mutually beneficial and allow for an exchange of information between them. It is recommended that S.R.I. be engaged to be the facilitator for such an arrangement.

REPLACEMENT FOR COAL TAR

There is a new potential for Canmet bottoms as a replacement for coal tar in flooring products where the solids content does not interfere with the application of the product. Such flooring systems are widely used and are very effective. However, there is increasing concern over the carcinogens in the coal tar and some countries, agencies and individual companies and unions, have called for the elimination of coal tar in products and product formulae.

PROPOSAL

S.R.I. will bring together all of the final pieces of information resulting from the market study and submit them to Canmet through the scientific authority for this study. S.R.I. is prepared to continue to try to establish a commercial project for Canmet residues under an extended agreement with Canmet.

The $21,675 cost of this market study was undertaken to prove out the potential for a mineral rubber asphalt to be produced using Banbot technology. The data developed indicated that the demand for Mineral Rubber Asphalt was insufficient to justify proceeding with the project. While the result is disappointing, it was a prudent decision to preclude building a manufacturing capability/or a product in serious decline.

The new products/markets identified from the study could lead to commercialization of the process. However, more work is required.

(file name/study)

SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations	July Shutdown? Other?
Acton Rubber	-	-	-	-	-	No reply.	-	-
Akro Rubber	-	-	-	-	-	Do not use.	-	-
American Biltrite	-	-	-	-	-	No reply.	-	-
Argus Ind. Supply	-	-	-	-	-	No use for MRA.	-	-
Baron Rubber	Yes	-	-	-	-	2 metric tonnes/yr or 4,409 lbs/yr.	-	-
Bata Footwear	-	-	-	-	-	No reply.	-	-
BF Goodrich USA	-	-	-	-	-	Use 100,000 lbs/yr.	-	-
Biltrite Rubber	Yes	-	-	Yes	Only when specified.	4 metric tonnes/yr or 8,818 lbs/yr.	-	-
Bridgestone USA	-	Yes, Bus & Truck	-	-	-	Use 150,000 lbs/yr.	-	-
Canoplast Inc.	-	-	-	-	-	No reply.	-	-
Chardon Rubber	-	-	-	-	-	Do not use.	-	-
C.R. Industries	-	-	-	-	-	Use small quantities.	-	-
Diversitic General	-	-	-	-	-	Do not use.	-	-
Epton Industries	-	-	-	-	-	Do not use.	-	-

SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations	July Shutdown? Other?
Firestone Canada	-	-	-	-	-	Use 15,000 lbs/yr.	-	-
Firestone USA	-	-	-	-	-	Use 200,000 lbs/yr.	-	-
Gates Rubber	Limited amount	-	Yes	-	-	Use 12,000 lbs/yr.	-	-
Gold Dust Target Co.	-	-	-	-	-	Do not use.	-	-
Goodyear Canada	Yes	-	-	Convevors	Syncrude Convevor Belt; Large Heavy Duty Syste	Bowmanville - 80,000 lbs/yr; Quebec City - 65,000 lbs/yr	Nil	July 2 wks
Goodyear Tire USA	-	-	-	-	-	Do not use.	-	-
Jacobs & Thompson	-	-	-	-	-	Do not use.	-	-
Kaufman Footwear	-	-	-	-	Shoe heels	Would use 12,000 lbs if approved.	-	-
Lion Rubber & Plastics	-	-	-	-	-	No reply.	-	-
McCreary Tire & Rub.	-	-	-	-	-	Do not use.	-	-
Meyers Chemical	-	-	-	-	-	No reply.	-	-
Michelin	-	-	-	-	-	No reply.	-	-
Midwest Rubber	-	-	-	-	-	Use 55,000 lbs/yr.	-	-
Ohio Rubber	-	-	-	-	-	Do not use.	-	-

SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations?	July Shutdown? Other?
Paeco Rubber	-	-	-	-	-	Do not use.	-	-
Scandura	-	-	-	-	-	Do not use.	-	-
Standard Products	-	-	-	-	-	No longer use.	-	-
Trent Rubber	Yes	-	Yes	Yes	Rubber Base Boards Rubber Extrusions	Use 30,000 lbs/yr.	Nil	-
Uniroyal Goodrich	-	-	-	-	-	No reply.	-	-
Wegu Canada	-	-	-	-	-	No reply.	-	-
						Total = ~~532,227~~ 723409 lbs/yr.		

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MRA - Mineral Rubber Asphalt
MRG - Mechanical Rubber Goods

Conversion factor: 1 metric tonne/yr = 2204.6 lbs/yr

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Acton Rubber	No reply.	
Akro Rubber	No usage.	No comments.
American Biltrite	No reply.	
Argus Ind. Supply	No use for MRA.	No comments.
Baron Rubber	Use MR-38 or Pioneer 42 type mineral rubber.	No comments.
Bata Footwear	No reply.	
BF Goodrich USA	Extremely reluctant to discuss a new source since this is a declining market.	No comments.
Biltrite Industries	Use Pioneer 42 type mineral rubber. Compound to specific recipes and only use MRA if it is specified.	No comments.
Bridgestone USA	Use at Nashville plant which produces truck and bus tires.	No comments.
Canoplast Inc.	No reply.	
Chardon Rubber	No usage.	No comments.
C.R. Industries	Use small quantities.	No comments.
Diversitic General	No usage.	No comments.
Epton Industries	No longer use MRA.	No comments.

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Firestone Canada	No comments.	No comments.
Firestone USA	Use at Des Moines, Iowa location only. Has been phased out at all other plants and is being phased out at Des Moines.	No comments.
Gates Rubber	Use MRA in mechanical rubber goods.	Declining use of MRA.
Gold Dust Target Co.	New use for CANMET bottoms.	No comments.
Goodyear Canada	No comments.	Consumption of MRA has declined as it was replaced by carbon black in tire production. The quality of tires has increased significantly in the past 10 years and the move to radial tires has added to this trend. Some 5 types of carbon black are used in tires with various grades used for treads and others for sidewalls.
Goodyear Tire USA	No usage.	No comments.
Jacobs & Thompson	Do not use MRA.	No comments.
Kaufman Footwear	Would use MRA if it were approved.	No comments.
Lion Rubber & Plastics	No reply.	
McCreary Tire & Rub.	No usage.	No comments.
Meyers Chemical	Developing data on MRA consumption in northeast USA.	No comments.
Michelin	No reply.	
Midwest Rubber	Used in one compound only. Usage is declining.	No comments.
Ohio Rubber	No usage.	No comments.

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Paeco Rubber	No usage.	No comments.
Scandura	Custom blend for companies and use their formulae.	No comments.
Standard Products	No longer use MRA.	No comments.
Trent Rubber	Goodyear represents 25% of total Canadian market. Tires, hoses and conveyor belts represent 75% of Canadian rubber consumption. U.S. mechanical goods consumption is 30 times the size of the Canadian market.	Chris Mumford (President) suggests that mineral rubber at $0.18-$0.20 per pound would be attractive and we could develop a market where it replaces a combination of process oil and carbon black. Mineral rubber is highly aromatic, is easily solvented and will provide a good hardness in mechanical goods like bumpers and and tools.
Uniroyal Goodrich	No reply.	
Wegu Canada	No reply.	

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MRA - Mineral Rubber Asphalt

SRI CANMET STUDY
IDENTIFIED USERS SPECIFIACTIONS FOR MINERAL RUBBER ASPHALT

Company	Comment	Note differences between the proposed specs and company specs	Critical test parameters and their impact	What variables are required?	Application
Baron Rubber	Use MR-38 or Pioneer 42 type mineral rubber.	-	-	-	Mechancial rubber goods.
BF Goodrich USA	No comments.	-	-	-	-
Biltrite Industries	Use Pioneer 42 type mineral rubber.	-	-	-	Mechanical rubber goods and rubber belting.
Bridgestone USA	No comments.	-	-	-	Bus and truck tires.
C.R. Industries	No comments.	-	-	-	-
Firestone Canada	No comments.	-	-	-	-
Firestone USA	No comments.	-	-	-	-
Gates Rubber	No comments.	-	-	-	-
Goodyear Canada	No comments.	-	-	-	Mechanical rubber goods and convevor belts.
Kaufman Footwear	Would use if approved.	-	-	-	Shoe heels.
Midwest Rubber	No comments.				
Trent Rubber	Normal mineral rubber is acceptable, MRA with Banbury Oil would be an advantage.	-	High melt point Stiffness Aromaticity.	Cheap and consistent product.	Tires, mechanical goods and crumb rubber.

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MRA - Mineral Rubber Asphalt

SRI CANMET STUDY
BANBURY OILS AND OTHER DISPOSAL PROBLEMS

Company	Banbury Oil to dispose of?	Quantities for disposal	Monthly Production	Current Disposal Practise	How cost effective is the disposal practise?	Would they pay to dispose of it?	Are they interested in our proposal?	How can we pickup the Banbury Oil?	Do they have samples for us to work on?
Firestone Canada	Yes	-	16000 gpa	-	-	-	-	-	-
Goodyear Canada	Yes	TBD	TBD	Collect but not segregated ie., other oils dumped in. Sent to Tricil.	Not	They pay now.	Yes	Will have to be segregated	Yes
Trent Rubber	Yes	30,000 gpy	2500 gpa	Pay to dispose. Major problem to find anyone willing to do it.	Very expensive $3-5/gal	They pay now.	Yes, view it as a service to rubber industry.	-	Yes, all we want
Uniroyal Goodrich	Yes	-	1800 gpa	-	-	-	-	-	-

INDEX
TBD - To be determined gpa - gallons per month
gpy - gallons per year

SRI CANMET STUDY
PRICING AND QUALITY CONTROL OF MINERAL RUBBER ASPHALT FOR IDENTIFIED USERS

Company	Is current supply imported?	Does it have freight and duty included or just freight?	What is the confirmed price per c.w.t. delivered?	What is the estimated price per c.w.t. delivered?	Is S.P.C. used?	What must be done to comply with S.P.C.?
Baron Rubber	-	-	-	-	-	-
BF Goodrich USA	-	-	-	-	-	-
Biltrite Industries	Yes from Harwick Co. USA.	-	$0.35/lb	$0.35/lb	-	-
Bridgestone USA	-	-	-	$0.18/lb to $0.20/lb	-	-
Firestone Canada	-	-	-	-	-	-
Firestone USA						
Gates Rubber	-	-	-	-	-	-
Goodyear Canada	Yes	-	-	-	Yes	Not known as volume is low.
Midwest Rubber	-	-	-	-	-	-
Trent Rubber	Yes from Harwick Co. USA. Other supplier is Witco.	Just freight.	$0.40/lb	$0.40/lb	Yes	Not known.

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SRI CANMET STUDY
PACKAGING OF MINERAL RUBBER ASPHALT, TERMS OF PAYMENT AND CREDIT REFERENCES FOR IDENTIFIED USERS

Company	How is product packaged now?	How would the customer prefer it?	Would the customer prefer dust free?	Would the customer prefer pellets	Will customer pay a premium for pellets?	In 25 kg bags?	Paper packaging	Plastic packaging	Terms of Payment	Credit Reference if applicable
Baron Rubber	-	-	-	-	-	-	-	-	-	-
BF Goodrich USA	-	-	-	-	-	-	-	-	-	-
Biltrite Industries	-	-	-	-	-	-	-	-	-	-
Firestone Canada	-	-	-	-	-	-	-	-	-	-
Firestone USA	-	-	-	-	-	-	-	-	-	-
Gates Rubber	-	-	-	-	-	-	-	-	-	-
Goodyear Canada	Pellets in bags	Pellets to reduce dust	Yes	Yes	Not determined at this time	-	Customer choice	Customer choice	-	Not necessary
Midwest Rubber	-	-	-	-	-	-	-	-	-	-
Trent Rubber	Ground powder	Ground powder or pellets	Yes	Yes	No	-	Does not matter	Does not matter	net 30 days	Yes

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SRI CANMET STUDY
OTHER PRODUCTS AND/OR DISPOSAL PROBLEMS

Company	Interested in process oils?	Volume of process oils?	Price of process oils?	Delivery of process oils?	Disposal Problems?
Firestone Canada	-	-	-	-	Banbury Oils.
Goodyear Canada	Yes, the currently use ESSO Naphathenics untreated.	Large but not divulged.	Controlled by U.S. - Akron.	Controlled by U.S. - Akron.	Banbury Oils.
Trent Rubber	-	-	-	-	Banbury Oils.
Uniroval Goodrich	-	-	-	-	Banbury Oils.

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SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations	July Shutdown? Other?
Acton Rubber	-	-	-	-	-	No reply.	-	-
Akro Rubber	-	-	-	-	-	Do not use.	-	-
American Biltrite	-	-	-	-	-	No reply.	-	-
Argus Ind. Supply	-	-	-	-	-	No use for MRA.	-	-
Baron Rubber	Yes	-	-	-	-	2 metric tonnes/yr or 4,409 lbs/yr.	-	-
Bata Footwear	-	-	-	-	-	No reply.	-	-
BF Goodrich USA	-	-	-	-	-	Use 100,000 lbs/yr.	-	-
Biltrite Rubber	Yes	-	-	Yes	Only when specified.	4 metric tonnes/yr or 8,818 lbs/yr.	-	-
Bridgestone USA	-	Yes, Bus & Truck	-	-	-	Use 150,000 lbs/yr.	-	-
Canoplast Inc.	-	-	-	-	-	No reply.	-	-
Chardon Rubber	-	-	-	-	-	Do not use.	-	-
C.R. Industries	-	-	-	-	-	Use small quantities.	-	-
Diversitic General	-	-	-	-	-	Do not use.	-	-
Epton Industries	-	-	-	-	-	Do not use.	-	-

SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations	July Shutdown? Other?
Firestone Canada	-	-	-	-	-	Use 15,000 lbs/yr.	-	-
Firestone USA	-	-	-	-	-	Use 200,000 lbs/yr.	-	-
Gates Rubber	Limited amount	-	Yes	-	-	Use 12,000 lbs/yr.	-	-
Gold Dust Target Co.	-	-	-	-	-	Do not use.	-	-
Goodyear Canada	Yes	-	-	Convevors	Syncrude Convevor Belt; Large Heavy Duty Syste	Bowmanville - 80,000 lbs/yr; Quebec City - 65,000 lbs/yr	Nil	July 2 wks
Goodyear Tire USA	-	-	-	-	-	Do not use.	-	-
Jacobs & Thompson	-	-	-	-	-	Do not use.	-	-
Kaufman Footwear	-	-	-	-	Shoe heels	Would use 12,000 lbs if approved.	-	-
Lion Rubber & Plastics	-	-	-	-	-	No reply.	-	-
McCreary Tire & Rub.	-	-	-	-	-	Do not use.	-	-
Meyers Chemical	-	-	-	-	-	No reply.	-	-
Michelin	-	-	-	-	-	No reply.	-	-
Midwest Rubber	-	-	-	-	-	Use 55,000 lbs/yr.	-	-
Ohio Rubber	-	-	-	-	-	Do not use.	-	-

SRI CANMET STUDY
DATA ON MINERAL RUBBER ASPHALT CONSUMPTION

Company	MRA used in MRG?	MRA used in Tires?	MRA used in Rubber Hose?	MRA used in Rubber Belting?	MRA used in Other Products?	Annual Consumption of MRA	Monthly Variations	July Shutdown? Other?
Paeco Rubber	-	-	-	-	-	Do not use.	-	-
Scandura	-	-	-	-	-	Do not use.	-	-
Standard Products	-	-	-	-	-	No longer use.	-	-
Trent Rubber	Yes	-	Yes	Yes	Rubber Base Boards Rubber Extrusions	Use 30,000 lbs/yr.	Nil	-
Uniroyal Goodrich	-	-	-	-	-	No reply.	-	-
Wegu Canada	-	-	-	-	-	No reply.	-	-
						Total = 532,227 lbs/yr.		

INDEX
MRA - Mineral Rubber Asphalt
MRG - Mechanical Rubber Goods

Conversion factor: 1 metric tonne/yr = 2204.6 lbs/yr

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Acton Rubber	No reply.	
Akro Rubber	No usage.	No comments.
American Biltrite	No reply.	
Argus Ind. Supply	No use for MRA.	No comments.
Baron Rubber	Use MR-38 or Pioneer 42 type mineral rubber.	No comments.
Bata Footwear	No reply.	
BF Goodrich USA	Extremely reluctant to discuss a new source since this is a declining market.	No comments.
Biltrite Industries	Use Pioneer 42 type mineral rubber. Compound to specific recipes and only use MRA if it is specified.	No comments.
Bridgestone USA	Use at Nashville plant which produces truck and bus tires.	No comments.
Canoplast Inc.	No reply.	
Chardon Rubber	No usage.	No comments.
C.R. Industries	Use small quantities.	No comments.
Diversitic General	No usage.	No comments.
Epton Industries	No longer use MRA.	No comments.

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Firestone Canada	No comments.	No comments.
Firestone USA	Use at Des Moines, Iowa location only. Has been phased out at all other plants and is being phased out at Des Moines.	No comments.
Gates Rubber	Use MRA in mechanical rubber goods.	Declining use of MRA.
Gold Dust Target Co.	New use for CANMET bottoms.	No comments.
Goodyear Canada	No comments.	Consumption of MRA has declined as it was replaced by carbon black in tire production. The quality of tires has increased significantly in the past 10 years and the move to radial tires has added to this trend. Some 5 types of carbon black are used in tires with various grades used for treads and others for sidewalls.
Goodyear Tire USA	No usage.	No comments.
Jacobs & Thompson	Do not use MRA.	No comments.
Kaufman Footwear	Would use MRA if it were approved.	No comments.
Lion Rubber & Plastics	No reply.	
McCreary Tire & Rub.	No usage.	No comments.
Meyers Chemical	Developing date on MRA consumption in northeast USA.	No comments.
Michelin	No reply.	
Midwest Rubber	Used in one compound only. Usage is declining.	No comments.
Ohio Rubber	No usage.	No comments.

SRI CANMET STUDY
COMMENTS ON CONSUMPTION OF MINERAL RUBBER ASPHALT AND INDUSTRY TRENDS

Company	Comments on Consumption of MRA	Comments on Industry Trends
Paeco Rubber	No usage.	No comments.
Scandura	Custom blend for companies and use their foraulae.	No comments.
Standard Products	No longer use MRA.	No comments.
Trent Rubber	Goodyear represents 25% of total Canadian market. Tires, hoses and conveyor belts represent 75% of Canadian rubber consumption. U.S. mechanical goods consumption is 30 times the size of the Canadian market.	Chris Mumford (President) suggests that mineral rubber at $0.18-$0.20 per pound would be attractive and we could develop a market where it replaces a combination of process oil and carbon black. Mineral rubber is highly aromatic, is easily solvented and will provide a good hardness in mechanical goods like bumpers and and tools.
Uniroyal Goodrich	No reply.	
Wegu Canada	No reply.	

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MRA - Mineral Rubber Asphalt

SRI CANMET STUDY
IDENTIFIED USERS SPECIFIACTIONS FOR MINERAL RUBBER ASPHALT

Company	Comment	Note differences between the proposed specs and company specs	Critical test parameters and their impact	What variables are required?	Application
Baron Rubber	Use MR-38 or Pioneer 42 type mineral rubber.	-	-	-	Mechancial rubber goods.
BF Goodrich USA	No comments.	-	-	-	-
Biltrite Industries	Use Pioneer 42 type mineral rubber.	-	-	-	Mechanical rubber goods and rubber belting.
Bridgestone USA	No comments.	-	-	-	Bus and truck tires.
C.R. Industries	No comments.	-	-	-	-
Firestone Canada	No comments.	-	-	-	-
Firestone USA	No comments.	-	-	-	-
Gates Rubber	No comments.	-	-	-	-
Goodyear Canada	No comments.	-	-	-	Mechanical rubber goods and conveyor belts.
Kaufman Footwear	Would use if approved.	-	-	-	Shoe heels.
Midwest Rubber	No comments.				
Trent Rubber	Normal mineral rubber is acceptable, MRA with Banbury Oil would be an advantage.	-	High melt point Stiffness Aromaticity.	Cheap and consistent product.	Tires, mechanical goods and crumb rubber.

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MRA - Mineral Rubber Asphalt

SPI CANMET STUDY
BANBURY OILS AND OTHER DISPOSAL PROBLEMS

Company	Banbury Oil to dispose of?	Quantities for disposal	Monthly Production	Current Disposal Practise	How cost effective is the disposal practise?	Would they pay to dispose of it?	Are they interested in our proposal?	How can we pickup the Banbury Oil?	Do they have samples for us to work on?
Firestone Canada	Yes	-	16000 gpa	-	-	-	-	-	-
Goodyear Canada	Yes	TBD	TBD	Collect but not segregated ie., other oils dumped in. Sent to Tricil.	Not	They pay now.	Yes	Will have to be segregated	Yes
Trent Rubber	Yes	30,000 gpy	2500 gpa	Pay to dispose. Major problem to find anyone willing to do it.	Very expensive $3-5/gal	They pay now.	Yes, view it as a service to rubber industry.	-	Yes, all we want
Uniroyal Goodrich	Yes	-	1800 gpa	-	-	-	-	-	-

INDEX
TBD - To be determined gpa - gallons per month
gpy - gallons per year

SRI CANMET STUDY

PRICING AND QUALITY CONTROL OF MINERAL RUBBER ASPHALT FOR IDENTIFIED USERS

Company	Is current supply imported?	Does it have freight and duty included or just freight?	What is the confirmed price per c.w.t. delivered?	What is the estimated price per c.w.t. delivered?	Is S.P.C. used?	What must be done to comply with S.P.C.?
Baron Rubber	-	-	-	-	-	-
BF Goodrich USA	-	-	-	-	-	-
Biltrite Industries	Yes from Harwick Co. USA.	-	$0.35/lb	$0.35/lb	-	-
Bridgestone USA	-	-	-	$0.18/lb to $0.20/lb	-	-
Firestone Canada	-	-	-	-	-	-
Firestone USA						
Gates Rubber	-	-	-	-	-	-
Goodyear Canada	Yes	-	-	-	Yes	Not known as volume is low.
Midwest Rubber	-	-	-	-	-	-
Trent Rubber	Yes from Harwick Co. USA. Other supplier is Witco.	Just freight.	$0.40/lb	$0.40/lb	Yes	Not known.

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SRI CANMET STUDY
PACKAGING OF MINERAL RUBBER ASPHALT, TERMS OF PAYMENT AND CREDIT REFERENCES FOR IDENTIFIED USERS

Company	How is product packaged now?	How would the customer prefer it?	Would the customer prefer dust free?	Would the customer prefer pellets	Will customer pay a premium for pellets?	In 25 kg bags?	Paper packaging	Plastic packaging	Terms of Payment	Credit Reference if applicable
Baron Rubber	-	-	-	-	-	-	-	-	-	-
BF Goodrich USA	-	-	-	-	-	-	-	-	-	-
Biltrite Industries	-	-	-	-	-	-	-	-	-	-
Firestone Canada	-	-	-	-	-	-	-	-	-	-
Firestone USA	-	-	-	-	-	-	-	-	-	-
Gates Rubber	-	-	-	-	-	-	-	-	-	-
Goodyear Canada	Pellets in bags	Pellets to reduce dust	Yes	Yes	Not determined at this time	-	Customer choice	Customer choice	-	Not necessary
Midwest Rubber	-	-	-	-	-	-	-	-	-	-
Trent Rubber	Ground powder	Ground powder or pellets	Yes	Yes	No	-	Does not matter	Does not matter	net 30 days	Yes

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SRI CANMET STUDY
OTHER PRODUCTS AND/OR DISPOSAL PROBLEMS

Company	Interested in process oils?	Volume of process oils?	Price of process oils?	Delivery of process oils?	Disposal Problems?
Firestone Canada	-	-	-	-	Banbury Oils.
Goodyear Canada	Yes, the currently use ESSO Naphathenics untreated.	Large but not divulged.	Controlled by U.S. - Akron.	Controlled by U.S. - Akron.	Banbury Oils.
Trent Rubber	-	-	-	-	Banbury Oils.
Uniroyal Goodrich	-	-	-	-	Banbury Oils.

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Markets Appendix I

RUBBER PRODUCTS

1 SIZE AND STRUCTURE

	Rubber Products	Percent of All Manufacturing
Estimated shipments ($ million, 1986)[1]	2,539	1.0
Major sub-sectors as percent of sector shipments (1984)		
Tire and tube industry and other rubber products industries	91.4	
Rubber hose and belting industries	8.6	
Estimated employment (numbers, 1986)[1]	25,564	1.4
Approximate concentration, top four enterprises percent of shipments (1982)	57.4	
Share of activity by medium and smaller production units (under 200 employees, 1984)		
Percent of establishments	86	98
Percent of employment	5	47
Percent of shipments	18	40

1 Published survey data adjusted for more recent reference year.

2 GEOGRAPHICAL DISTRIBUTION OF INDUSTRY

	Percentage Distribution of Shipments, (1986)[2]	
	Rubber Products	All Manufacturing
Quebec	39.7	25.3
Ontario	-	53.3
British Columbia	-	8.2
Other provinces	-	14.1
Canada		100.0

2 Percentages may not add up to 100 due to lack of data for confidential purposes.

3 APPARENT MARKET

	Rubber Products ($ million, 1986)	Percent of All Manufacturing
Shipments	2,539	1.0
Domestic exports	912	0.9
Domestic shipments	1,627	1.1
Imports[3]	792	0.8
Apparent market[3]	2,419	1.0

3 Exclusive of re-exports brought into the country, but not entering the Canadian consumption stream.

SOURCE : THE CANADIAN EDGE
INVESTMENT CANADA
FEB. 1988.

Markets Appendix I

4 EXTERNAL TRADE

	Rubber Products	Percent of All Manufacturing
Export orientation (1986)	35.9 percent of shipments	28.9
Import penetration (1986)	32.7 percent of apparent market	39.8

Major export clients, 1986 (percent)	United States	93.4
	Japan	1.1
	EEC[4]	1.0
	Other OECD	1.1
	Non-OECD	3.4
Major import sources, 1985 (percent)	United States	66.7
	EEC[5]	8.4
	Other OECD	8.9
	Non-OECD	6.0

4 Includes Portugal and Spain
5 Exludes Portugal and Spain

5 INVESTMENT AND PROFITABILITY

	Rubber Products[6]			Percent of All Manufacturing		
	1985	1986	1987	1985	1986	1987
	($ million)					
New capital expenditures						
Machinery and equipment	104.2	120.3	161.2	1.2	1.0	1.3
Construction	14.1	10.6	7.5	0.5	0.4	0.3
TOTAL	118.3	130.9	168.7	1.0	0.9	1.1

	1984	All Manufacturing 1984
Profits as percentage of sales of goods and services	3.9	4.0

6 Actual expenditures 1985, preliminary actual 1986, intentions 1987.

6 MAJOR FIRMS AND COUNTRY OF CONTROL

B.F. Goodrich Canada Inc. (US); Firestone Canada Inc. (US); General Tire Canada Ltd. (US); Goodyear Canada Inc. (US); Michelin Tires (Canada) Inc. (French); Polysar Ltd. (Cdn); Rubbermaid Canada Inc.; Uniroyal Ltd. (US).

7 PRODUCTS

Tires and tubes (all types of vehicles)
Rubber moulded goods
Rubber belts and belting
Rubber hoses
Compounded or sonic processed, natural or synthetic rubber, treated rubber
Tapes

8 OWNERSHIP

	Percentage of Foreign Control, 1984	
	Rubber Products ($ million)	All Manufacturing
Assets	92.2	44.3
Sales	89.8	50.4
Profits	91.9	63.3

9 TECHNOLOGICAL SITUATION

	Rubber Products ($ million, 1986)	Percent of All Manufacturing
Intramural R&D outlays		
Current	10	0.4
Capital	•	•
TOTAL	10	0.4
Number of persons engaged in R&D in 1984	n/a	n/a
Number of firms engaged in R&D in 1984	9	0.98
General level of technology	Low	

• Too small to be expressed (under $500,000).

10 ROLE OF GOVERNMENT

The industry has import quotas and tariffs in the range of 9 percent to 12 percent against low cost import competition. The federal government owns Polysar Ltd., the world's largest manufacturer of synthetic rubber and rubber latex. Industrial assistance is available under the Industrial and Regional Development Program (IRDP) and export assistance under the Program for Export Market Development (PEMD) and through the Export Development Corporation (EDC). The Industrial Research Assistance Program (IRAP) administered by the National Research Council (NRC) provides assistance to the industry to undertake research activities in Canada.

11 INDUSTRIAL RELATIONS

	Rubber Products	Percent of All Manufacturing
Days lost		
Average, 1983-85	77,367	4.9
Lost during 1986[7]	84,380	6.3
Days lost as percent of total time worked (1986)	1.3	0.3

7 Does not include data on work stoppages under Quebec and federal jurisdiction for November-December 1986.

12 GENERAL ACTIVITY CHANGES, 1980-86 (Real Output)

Comparative Cyclical Pattern

	Rubber Products	All Manufacturing
Peak	2nd Q, 1981	2nd Q, 1981
Trough	4th Q, 1982	4th Q, 1982
Recovery	3rd Q, 1983	2nd Q, 1985

Annual Activity Change

	Percentages	
1982	-6.1	-11.1
1983	10.6	6.1
1984	19.9	7.1
1985	-5.3	0.7
1986	0.9	1.7

13 LATEST GENERAL PERFORMANCE

	Percent change 1986-85	
	Rubber Products	All Manufacturing
(a) Real production	0.9	1.7
(b) Employment	2.7	2.1
(c) Implied productivity ((a) less (b))	-1.8	-0.4
(d) Average weekly wages and salaries	4.5	3.3
(e) Implied unit labour costs ((c) less (d))	-6.3	-3.7